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Which better predicts conduct problems? The relationship of trajectories of conduct problems with ODD and ADHD symptoms from childhood into adolescence

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Background: To assess the co-occurrence in deviant trajectories of parent-rated symptoms of conduct disorder (CD), oppositional defiant disorder (ODD) and attention-deficit/hyperactivity disorder (ADHD) from age 4 to 18 years old in a general population sample of Dutch children. **Methods:** Developmental trajectories of CD, ODD, and ADHD were estimated in a sample of 1,016 males and 1,060 females. Children's disruptive problem behaviors were rated at 5 time-points. The co-occurrence patterns between the deviant CD trajectory, and the high ODD and high ADHD trajectory were studied for males and females separately. **Results:** Four percent of males and 2% of females followed a deviant CD trajectory. Six percent of the sample followed a high ODD trajectory, and 5% a high ADHD trajectory. Engagement in the deviant CD trajectory was predicted by ODD and ADHD in females, but only by ODD in males. **Conclusions:** Although ADHD co-occurs with CD, the association between ADHD and CD is largely accounted for by accompanying ODD. Gender differences should be taken into account in understanding the onset of CD. **Keywords:** Conduct disorder, oppositional defiant disorder, attention-deficit/hyperactivity disorder, comorbidity, sex differences.

DSM-IV (American Psychiatric Association, 1994) lists three types of disruptive disorder: conduct disorder (CD), oppositional defiant disorder (ODD) and attention-deficit/hyperactivity disorder (ADHD), each occurring in about 1–8% of the population (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Verhulst, van der Ende, Ferdinand, & Kasius, 1997). CD, ODD, and ADHD frequently co-occur (e.g., American Psychiatric Association, 1994). However, our knowledge about the nature of this co-occurrence is limited. This is especially the case because findings on the CD–ODD–ADHD co-occurrence are mainly based on male, clinical samples. This raises the question on the generalizability of these findings to broader populations, including females. The goal of this study is therefore to explore the co-occurrence patterns in trajectories of parent-rated disruptive behavior symptoms that reflect DSM-IV categories of CD, ODD and ADHD from the Child Behavior Checklist (CBCL; Achenbach, 1991; Achenbach & Rescorla, 2001).

As stated, most of the evidence on the association between CD, ODD and ADHD is based on clinical samples, with the risk of finding elevated comorbidity rates due to referral bias. In fact, in clinically referred boys with CD, as high as 80% have been reported to meet criteria for ODD as well (Lahey, McBurnett, & Loeber, 2000; Loeber, Green, Keenan, & Lahey, 1995). ADHD has also been associated with

CD, especially in clinical samples (Biederman, Faraone, Milberger, & Guite, 1996a; Kuhne, Schachar, & Tannock, 1997; Lahey et al., 1999a; Loeber et al., 1995). For instance, Loeber et al. (1995) reported that of 7–12-year-old clinic referred boys with ADHD, almost 50% developed CD one to five years later. Knowledge about these associations in general population samples is limited, although Costello et al. (2003) reported significant co-occurrence between the three disorders in their population sample.

Given the findings from both clinical and population samples about the CD–ODD–ADHD co-occurrence, this raises the issue of the nature of the association. Specifically, Lahey and colleagues maintain that when taking ODD and ADHD into account simultaneously, the association between ADHD and CD especially becomes less strong (Lahey & Loeber, 1994; Lahey, Waldman, & McBurnett, 1999b). To substantiate this claim, they reported findings in clinically referred boys, showing that ODD was a much better predictor of the onset of CD than was ADHD (Lahey, Loeber, Burke, Rathouz, & McBurnett, 2002; Lahey et al., 2000; Loeber, Green, Lahey, Frick, & McBurnett, 2000). Again, evidence from general population studies is limited. However, findings from the longitudinal general population study by Costello et al. (2003) showed that both ADHD and ODD were associated with CD. The association between ODD and CD was, however, much stronger than the association between ADHD and

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CD, suggesting a dominance of ODD over ADHD in predicting CD.

To understand the developmental origins of ADHD-ODD-CD co-occurrence patterns it is important to study them longitudinally. Several studies have explored developmental trajectories using scale scores of symptoms of disruptive behavior (e.g., Nagin & Tremblay, 1999). The advantage of this approach is that co-occurrence between deviant trajectories is delineated over time. Using this approach, Nagin and Tremblay (1999) studied the co-occurrence between deviant trajectories of oppositional problems and hyperactivity in relation to a deviant physical aggression trajectory among males from 6 to 15 years old. They found that of the boys who were chronically high on physical aggression, approximately half were also high on oppositionality. In contrast, only 13% of the chronically physically aggressive boys also followed a chronic trajectory of hyperactivity. Physical aggression is, however, only one part of the CD spectrum as described by DSM-IV. Therefore, to our knowledge, no study has yet explored the longitudinal co-occurrence between distinct developmental trajectories using the DSM-IV scheme of disruptive behavior disorders in both males and females across an age range that includes both childhood and adolescence. Based on the mixed evidence cited above, we expected the developmental association between ADHD and CD to dissipate once the influence of ODD is accounted for.

Most findings on disruptive behavior disorders are based on male samples. This affects our possible conclusions on the ADHD-ODD-CD association, especially because some recent studies have shown gender-specific pathways in disruptive behavior problems. For instance, the population-based study by Costello et al. (2003) found a much stronger link between ODD and ADHD and CD among girls than among boys. In addition, it was found that the longitudinal link of ADHD predicting the onset of ODD was found only in females. Moreover, Lahey et al. (2000) reported that the association between ADHD and CD was rendered into insignificance after controlling for ODD in boys. However, among girls, ADHD remained a significant predictor of CD, even when controlling for ODD. Therefore, although there is ample evidence for a link between ADHD and CD, it is not clear whether this link survives after controlling for the association between ODD and ADHD, and whether such findings are consistent among males and females.

Thus, we aim to study the developmental trajectories of parent-reported symptoms – through the CBCL/4–18 – of DSM-IV defined syndromes of CD, ODD and ADHD in a general population sample of Dutch children from ages 4 to 18 years. The DSM-IV scales of the CBCL/4–18 have been found to accurately predict DSM-IV diagnoses in both clinical and population samples (Hudziak, Copeland, Stanger, &

Wadsworth, 2004; Lengua, Sadowski, Friedrich, & Fisher, 2001). Given these trajectories, our aim is to study the co-occurrence between deviant trajectories of these syndromes and to address sex differences in these co-occurrence patterns.

Methods

Sample

Data collection started in 1983 when 2,600 children and adolescents from 13 birth cohorts aged 4 to 16 years were drawn from the Dutch province of Zuid-Holland. This province encompasses more than 20% of the Dutch population in environments ranging from rural to highly urbanized. A random sample was drawn of 100 children of each gender and age with Dutch nationality. Of the 2,447 parents reached, 2,076 responded and provided usable data (84.8%). These respondents were interviewed at 2-year intervals until 1991 (5 waves) in which a total of 6,932 observations were collected that were used in the present study. The sample in 1983 included 1,016 males and 1,060 females. For details of the initial data collections, see Verhulst, Akkerhuis, and Althaus (1985).

The age range of the CBCL that was used in the 1983 and 1985 assessments was 4 to 16 years. For the remaining assessments the 1991 version of the CBCL was used with an age range from 4 to 18 years. As a consequence, only 1,149 of the 2,076 individuals who participated in 1983 could participate in all five waves. For 68.8% of these 1,149 participants the CBCL was completed at all five waves. However, data of participants between 4 and 18 years of age at any time point ($n = 2,076$) were used. Because of the multiple birth cohort design of the study, no single person was assessed at age 4 and age 18. Of the total 2,076 individuals, 475 (22.9%) participated at only one assessment, mainly because the individual exceeded the age range of the CBCL. For a tabular overview of the sample used in this study, see Bongers, Koot, van der Ende, and Verhulst (2003, 2004). To investigate selective attrition, dropouts and those remaining were compared with respect to their 1983 CBCL scale scores, correcting for 1983 age and gender. Participants with missing assessments did not differ significantly from participants with assessments available at all five waves on any of the CBCL scales.

Measures

Children's symptoms of CD, ODD and ADHD over the last 6 months were rated on the Child Behavior Checklist/4–18 (CBCL; Achenbach, 1991). Parents rate their child's behavior on a 3-point scale (0 = *not true*, 1 = *somewhat true*, 2 = *very true or often true*). The CBCL has been translated and validated for use in the Netherlands (Verhulst, van der Ende, & Koot, 1996). CBCL items reflecting a similar content to DSM-IV criteria for CD, ODD, and ADHD were used in the analysis (Achenbach & Rescorla, 2001). The CD scale was comprised of 15 items including Fights a lot, Cruel to others, Sets fire, Vandalism, Steals from home, Steals outside home, Runs away from home. The ODD scale

was comprised of five items including Temper tantrums, Argues a lot, Disobedient (at home / at school). The ADHD scale was comprised of five items including Can't concentrate, Is impulsive, Can't sit still, Is very loud. Confirmatory factor analyses conducted on data from the first assessment showed that these items well reflected the DSM-IV defined syndromes in our sample: CFI = .94, TLI = .97, RMSEA = .04.

Statistical approach

Analyses were carried out in three stages. First, males' and females' developmental trajectories of CD, ODD, and ADHD were determined separately through growth mixture modeling (GMM; Muthén & Shedden, 1999). GMM identifies distinct developmental trajectories of children's disruptive problems and estimates the growth parameters of each of these trajectories (e.g. stable high, rising, stable low). Three criteria were used to determine the optimal number of classes. The first is the sample size adjusted Bayesian Information Criterion (SABIC; Kass & Raftery, 1993; Schwartz, 1978). Lower SABIC values indicate improvement of the model when compared to the model with one class fewer. The second is the usefulness of the classes, which is the subjective interpretation of the developmental course of the trajectories and the number of children in each class. The third is the stability of the model which was tested through the use of different starting values. For each model, 50 random permutations of starting values were generated by the program. A model is stable when despite different starting values, similar solutions are obtained. These three criteria were used to decide on the optimal model in a hierarchical manner. That is, as long as the usefulness and stability criteria were met, the model with the lowest SABIC value was considered the optimal solution. The outcomes of the trajectory model are 1) class membership probabilities, which give the probabilities of an individual belonging to each of the classes, and 2) the means and variances of the growth parameters (intercept, slope, quadratic slope).

The distributions of the CD, ODD, and ADHD symptom scores were non-normal. To accommodate this censoring problem, we modeled the developmental trajectories using a censored normal distribution.

Second, for the logic of comparing co-occurrence patterns between males and females, it is important to assess whether males and females differ in the developmental courses of the trajectories of CD, ODD and ADHD. Male and female trajectory models were joined in a multiple group growth mixture model. We first estimated the multiple group model without any constraints on the growth parameters. We then constrained growth parameters between male and female trajectories (e.g., the deviant male and female trajectories) to be equal (first intercept, followed by linear and quadratic slope) while holding class membership probabilities equal to the probabilities obtained from the non-constrained multiple group model. Loglikelihood difference tests – using the Satorra–Bentler scaled chi-square tests (Satorra, 2000) – were used to test for sex effects on the growth parameters.

Third, to study co-occurrence, two dual trajectory models were analyzed: one for CD and ODD and one for CD and ADHD. Models were run for males and females

separately. A categorical latent variable was considered for CD and another for ODD or ADHD problems. The trajectory classes of CD were regressed on the ODD and ADHD trajectory classes. The co-occurrence probabilities follow directly from these models. Logistic regression models were run for males and females separately to study the association between deviant ODD and ADHD classes and a deviant CD class. Developmental trajectories were analyzed with Mplus 4.0 (Muthén & Muthén, 1998–2006).

Results

Descriptive data

Mean levels of symptoms of CD, ODD and ADHD from age 4 to 18 years are in Table 1. Given the many significant gender differences in the levels of CD, ODD and ADHD, the trajectory models were run for males and females separately.

Number of developmental trajectories

Table 2 gives an overview of the criteria used to determine the optimal number of developmental trajectories. For CD, up to 5 classes were fitted for both boys and girls. Although SABIC values were lower for the four- and five-class solutions than for the three-class solution, the four- and five-class solutions resulted in trajectory classes comprised of very few children (less than 1.5%; not meeting criteria for usefulness) or were unstable (not meeting the stability criterion). For ODD, SABIC indicated a four-class solution as the optimal model among males. Adding a fifth class resulted in an additional low ODD problems class, which we found non-informative (not meeting the usefulness criterion). For females, moving to more than four ODD trajectories resulted in unstable solutions. For ADHD, in both males and females moving beyond four ADHD trajectories resulted only in the addition of classes with low ADHD problems, which we considered not to meet criteria for usefulness. To test for possible cohort effect on the developmental trajectories of CD, ODD and ADHD, each of the 13 cohorts were entered (dummy coded) as predictors of class-membership, as well as covariates for the growth parameters. Given the large number of tests, $p < .001$ was used as criterion of significance. No effects of cohort were found.

Developmental trajectories

The developmental trajectories (model estimated trajectories) are presented in Figure 1. Prevalence rates of the trajectories are in Table 3. A small minority of the children (4% of all boys, 2% of all girls) were characterized by low levels of conduct problems in early childhood, followed by increasing levels in childhood that peaked in adolescence.

Table 1 Means and standard deviations for symptoms of CD, ODD and ADHD for males and female from 4 to 18 years old

Age	CD					ODD					ADHD				
	Males		Females		Test	Males		Females		Test	Males		Females		Test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>
4	1.36	1.59	1.17	1.47	.6	2.81	2.22	2.21	1.73	3.8	3.52	2.24	3.02	2.18	2.0
5	1.81	2.23	.86	1.52	10.7**	2.32	1.75	2.14	1.99	.4	3.58	2.45	2.48	2.39	8.6**
6	1.84	2.43	.80	1.29	21.4**	2.42	2.13	1.82	1.78	7.0**	3.05	2.39	2.22	2.22	9.5**
7	1.63	2.24	.79	1.28	16.2**	2.19	2.00	1.61	1.68	7.4**	3.24	2.64	2.49	2.43	6.7**
8	1.48	2.02	.87	1.40	14.1**	2.25	2.01	1.86	1.95	4.4*	3.04	2.50	2.39	2.42	7.9**
9	1.63	2.36	.72	1.42	24.7**	2.20	2.13	1.71	2.03	6.2*	3.19	2.71	2.31	2.50	12.4**
10	1.39	1.95	.70	1.24	25.3**	2.17	2.01	1.80	1.85	5.2*	2.89	2.52	2.17	2.24	13.0**
11	1.34	1.98	.73	1.45	18.2**	2.12	2.03	1.71	1.91	6.5*	2.92	2.48	2.04	2.26	20.0**
12	1.41	2.27	.82	1.71	15.3**	2.06	1.96	1.77	1.75	4.3*	2.61	2.40	1.94	2.12	15.3**
13	1.30	2.18	.77	1.57	14.2**	2.05	2.03	1.81	1.88	2.6	2.76	2.42	1.89	2.19	25.2**
14	1.21	2.30	.84	1.59	6.0*	1.88	1.84	1.69	1.80	1.9	2.19	2.09	1.78	2.04	6.7**
15	1.19	2.51	.85	1.78	4.0*	1.89	2.11	1.80	1.97	.3	2.33	2.25	1.84	2.06	8.9**
16	1.10	1.99	.84	1.56	3.3	1.71	2.00	1.57	1.85	.9	1.93	2.18	1.72	1.93	1.8
17	1.05	1.98	.93	1.66	.4	1.55	1.90	1.53	1.85	.0	1.80	1.97	1.51	1.79	2.2
18	1.00	1.79	.37	.96	9.9**	1.24	1.55	.99	1.33	.2	1.52	1.88	1.21	1.50	1.7

Note. * $p < .05$; ** $p < .01$.

Approximately one-third of both boys and girls (37%) followed a moderate trajectory of CD. The remaining 60% of boys and girls had low CD problem scores.

For ODD problems, none of the quadratic growth terms were significant and thus were deleted from the model. Overall, 6% of the children followed a trajectory with high ODD scores (6% of the boys, 5% of the girls). Approximately 28% followed the moderate ODD trajectory, 46% followed the low ODD trajectory and the remaining 21% had near zero levels of ODD problems with age. Only 5% of the sample followed the high ADHD trajectory, characterized by increasing scores into late childhood, and decreasing thereafter. The remainder of the sample followed either a moderate (27% of the sample), low (40%) or near zero level trajectory (27%) of symptoms of ADHD.

Co-occurrence between deviant CD, ODD and ADHD trajectories

Given our focus on deviant CD, ODD and ADHD trajectories, the remainder of the presentation of results will focus on these trajectories. For the

interpretation of the male and female co-occurrence patterns it is essential to know whether the levels of problems in the trajectories are similar for males and females. The test statistics of sex difference in the growth parameters are given in Table 4. For the adolescent peak CD trajectory, a significant sex effect on the intercept was found, showing that males in this trajectory had consistently higher levels of conduct problems than females in this trajectory. For ODD and ADHD symptoms no sex effects on the growth parameters of the deviant trajectories were found.

The comorbidities between the trajectories are projected in Table 5. It shows that boys and girls who followed the high ODD trajectory were very likely to also follow the adolescent peak CD trajectory (71% of the males, 79% of the females). It also showed that none of the children on the high ODD trajectory followed the low CD trajectory. Males and females who followed the high ADHD trajectory were most likely to follow the moderate CD trajectory; only one-third of the children on the high ADHD trajectory followed the adolescent peak CD trajectory.

Table 2 Overview of criteria to decide on optimal solution

No. of classes	Symptoms of					
	CD		ODD		ADHD	
	Males	Females	Males	Females	Males	Females
1	11528	9339	13216	13312	14354	14048
2	11017	8854	12555	12588	13278	12967
3	10720	8654	12285	12340	13002	12660
4	Low cc	Low cc	12236	12266	12900	12533
5	Unstable	Unstable	12227	Unstable	12883	12519
6	–	–	–	Unstable	–	–

Note. Entries are sample size adjusted BIC values with optimal solution in boldface type. Only values for models meeting the stability or usefulness criteria are printed. Dashes indicate that this model was not tested. Low cc = low class count.

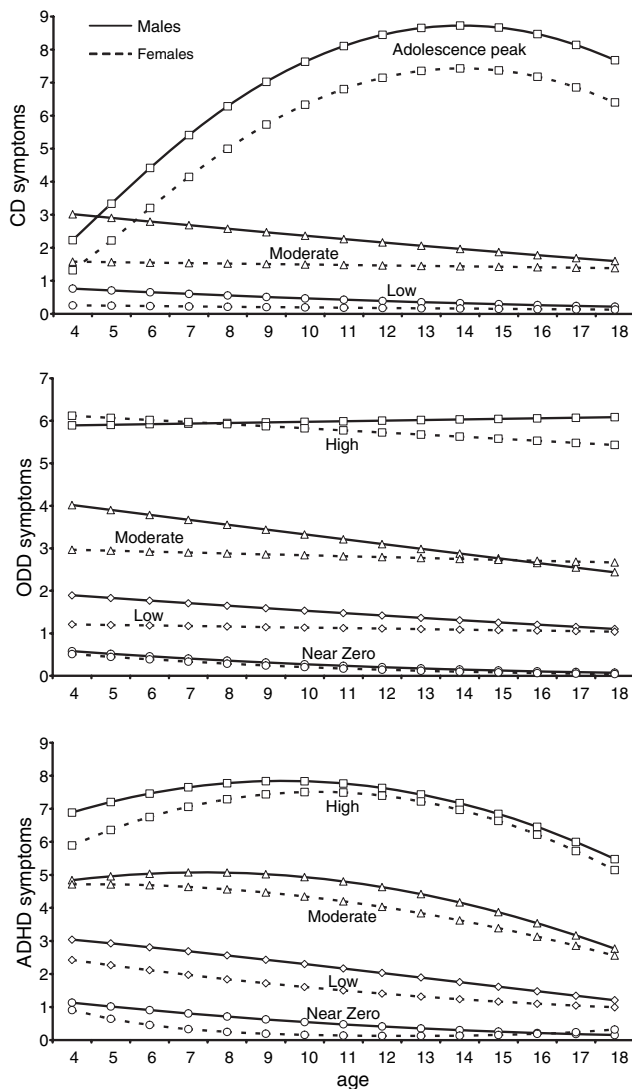


Figure 1 Developmental trajectories of CD, ODD and ADHD symptoms from 4 to 18 years

The results thus showed that the comorbidity between the high ODD trajectory and the adolescent peak CD trajectory was higher than the comorbidity between the high ADHD trajectory and the

Table 3 Distribution of males and females in each developmental trajectory (%)

	Males (<i>n</i> = 1,016)	Females (<i>n</i> = 1,060)
CD trajectories		
Adolescence peak	4	2
Moderate	37	37
Low	59	61
ODD trajectories		
High	6	5
Moderate	28	27
Low	44	47
Near zero	21	21
ADHD trajectories		
High	5	4
Moderate	27	26
Low	40	43
Near zero	27	27

adolescent peak CD trajectory. To further explore the comorbidity between the trajectories of CD, ODD, and ADHD, we estimated the unique contribution of high ODD and ADHD problems in predicting the adolescent peak CD trajectory through logistical regression. The models were run for males and females separately. First, we estimated whether classification to the deviant CD trajectory was predicted by membership of the deviant ADHD trajectory (step 1; Table 6). In the second step we added deviant ODD trajectory membership. It showed that the association between deviant ADHD and CD was reduced drastically when deviant ODD trajectory membership was controlled (effect of ADHD became non-significant in males, OR changed from 30.33 to 7.84 in females). This showed that among males the estimated variance between ADHD and CD was accounted for by associated ODD. However, because the link between ADHD and CD remained significant in females, the mediation by ODD is only partial among them.

Discussion

Approximately 4% of the males and about 2% of the females followed a deviant adolescent-peak CD trajectory, which is in accordance with previous findings focusing on deviant male aggression trajectories (Broidy et al., 2003; Nagin & Tremblay, 1999) and prevalence rates of CD in males and females (Costello et al., 2003). It is, however, important to notice that females on the high CD trajectory had fewer conduct problem symptoms than males on the deviant CD trajectory. This finding may be in accordance with a previous study that suggested gender-specific criteria for conduct disorder (Zoccolillo, Tremblay, & Vitaro, 1996).

With regard to the co-occurrence between the high CD trajectory and high ODD and ADHD trajectory, the high co-occurrence between the adolescent peak CD trajectory and the high ODD trajectory is especially pronounced. Although still a large number of boys and girls from the high ADHD trajectory also followed the adolescence peak CD trajectory, this percentage was much lower than found for ODD-CD. The lower co-occurrence between CD and ADHD than CD and ODD is in accordance with previous findings among males in particular (Lahey et al., 2000; Nagin & Tremblay, 1999). When we tested the predictive associations between ODD and ADHD, and CD, we found that only ODD predicted CD among males, whereas in females both ODD and ADHD predicted CD. However, although in females the ADHD-CD association remained significant after controlling for ODD, the association between ODD and CD was much stronger, and mediated a large proportion of the variance between CD and ADHD. The finding that ODD has more ramifications for the development of CD than ADHD is in accordance with

Table 4 Gender effects in growth parameters of trajectories of CD, ODD, and ADHD symptoms

Model	Gender effects	Adolesc. peak	Moderate	Low	
CD					
1	Intercept	5.30*	75.73**	114.55**	
2	Intcpt + Slope	.01	10.48**	6.68*	
3	Intcpt + Slope + Quadratic	.02	–	–	
		High	Moderate	Low	Near Zero
ODD					
1	Intercept	3.24	27.46**	60.21**	9.83**
2	Intcpt + Slope	.77	22.06**	12.07**	.68
ADHD					
1	Intercept	1.67	33.68**	103.36**	60.09**
2	Intcpt + Slope	1.16	.01	5.56*	8.94**
3	Intcpt + Slope + Quadratic	.36	1.96	.58	2.73

Note. Estimates represent $-2 \times \text{loglikelihood difference values}$ ($\Delta \text{df} = 1$). Models are hierarchical. When significant, models 3 incorporated significant gender effects on all growth parameters, while models 2 incorporated significant gender differences on linear slope and intercept. Dashes indicate that this model was not tested. ** $p < .01$; * $p < .05$.

previous reports on males and females (Lahey et al., 2000).

Of interest is that the adolescent peak CD trajectory started off with low levels of CD in early childhood. This was in contrast to the children on the high ODD and ADHD trajectories; their levels of problem behaviors were already at their maximum in early childhood. The finding on gender-specific relationships between CD, ODD, and ADHD, which is in accordance with the report by Lahey et al. (2000), may reinforce their hypotheses that among boys, ODD behaviors increase the risk for developing CD behaviors, regardless of whether or not they display ADHD behaviors, whereas for girls both ADHD and ODD are precursors to CD (p. 439). Our findings confirmed that indeed in both males and females, ODD in particular is best viewed as a precursor to CD – possibly because, like CD, it is an intrinsic part of coercive cycles (see also Lahey et al., 1992; Lahey et al., 2000; Loeber et al., 1995). This does not, however, rule out the risk of early ADHD in CD development. That is, children with ADHD are at

risk of developing CD, possibly because it triggers controlling behavior or rejection from parents that may lead to the development of coercive child–parent transactions, which may first be expressed as ODD-type behaviors but eventually may lead to the onset of CD (Loeber & Stouthamer Loeber, 1998). ADHD symptoms should not just be seen as forerunners to CD, but are best viewed as risk markers for CD symptoms.

This study has some limitations. First, actual DSM-IV diagnostic information was not available. For the CD, ODD, and ADHD trajectories in this study, items of the CBCL were grouped on the basis of child psychiatrists' and psychologists' judgment whether CBCL-items described DSM-IV categories (cf. Achenbach & Rescorla, 2001). Not all DSM-IV behavioral criteria, and indications on impairment, were available. However, CBCL/4–18 scales accurately predicted DSM-IV diagnoses in both clinical and population samples (Hudziak et al., 2004; Lengua et al., 2001). Second, only parent reports were used. Although parents are one of the main informants for the assessment of psychopathology in their children – both for rating scales such as the CBCL and for diagnostic instruments such as DISC-P – certain behaviors such as stealing or fire setting

Table 5 Co-occurrence (%) between developmental trajectories of CD symptoms and developmental trajectories of ODD and ADHD symptoms

	CD trajectories					
	Males			Females		
	Adolesc. peak	Moderate	Low	Adolesc. peak	Moderate	Low
ODD trajectories						
High	71	29	0	79	21	0
Moderate	1	99	0	0	100	0
Low	1	15	84	0	13	87
Near zero	0	0	100	0	0	100
ADHD trajectories						
High	35	65	0	33	60	7
Moderate	3	79	18	3	88	9
Low	0	29	71	0	27	73
Near zero	1	0	99	0	2	98

Table 6 Logistic regression analyses for variables predicting the adolescent peak CD trajectory

	Males			Females		
	B	SE B	OR	B	SE B	OR
Step 1						
ADHD	2.43	.37	11.30**	3.41	.50	30.33**
Step 2						
ADHD	.72	.47	2.07	2.06	.62	7.84**
ODD	3.61	.42	37.08**	4.01	.62	54.90**

Note. Reference categories were children in the two (ODD) and three (ADHD) non-deviant trajectories. For males, R^2 for step 1 = .12; R^2 for step 2 = .37. For females, R^2 for step 1 = .20; R^2 for step 2 = .46. OR = Odds Ratio. ** $p < .01$; * $p < .05$.

outside the home may remain out of their awareness. However, the parent-reported CBCL delinquency scale, which includes such items, was found to predict a variety of poor outcomes, including contact with police, academic problems and having received mental health services (Verhulst, Koot, & van der Ende, 1994) in addition to DSM-IV disruptive behavior disorders 14 years later (Hofstra, van der Ende, & Verhulst, 2002). Moreover, when comparing parent-reports with children's and teacher-reports, only parent-reported conduct disorder symptoms were found to predict police contacts (Loeber, Green, Lahey, & Stouthamer-Loeber, 1991). The aim of this study was to explore the co-occurrence patterns between CD, ODD and ADHD. Both strong as well as weaker associations were found, indicating that even if parents underrated certain covert behaviors, this did not overtly influence the associations as found in this study. Finally, despite the large sample size and the presence of both males and females, the absolute number in the deviant CD trajectories was low. We would therefore like to see our findings on sex differences in the associations between symptoms of CD, ODD, and ADHD replicated by others.

The results of this study have implications for the screening of conduct problems and our understanding of the pathways leading to conduct problems in boys and girls. This study showed that in both males and females, symptoms of ODD have far more ramifications than ADHD for the development of CD problems. The fact that CD problems (not obviously present in early childhood) were better predicted by ODD than ADHD (both clearly present in early childhood) implies that when screening for children at risk of following a high CD problems trajectory, one should screen for ODD-type behaviors in early childhood. However, the finding that ADHD predicted the adolescent peak CD trajectory above and beyond high levels of ODD in girls implies that gender should be taken into account in understanding the onset of CD.

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